Present Claims

40. (Currently Amended) An optical interconnect system comprising:

an optical interconnect device configured to selectively interconnect a plurality of electromagnetic signals between a plurality of inputs and a plurality of outputs;

said optical interconnect device having a plurality of solid state selectively actuatable 2x2 optical switching elements and a plurality of all-optical signal paths extending through said 2x2 optical switching elements between the plurality of inputs and the plurality of outputs, said 2x2 optical switching elements capable of causing switching between polarization states of said electromagnetic signals;

wherein each of said plurality of all-optical signal paths has substantially the same pathlength.

41. (Original) The interconnect system of claim 40, comprising a switching module configured to selectively actuate each of said 2x2 optical switching elements.

42. (Original) The optical interconnect system of claim 41, wherein said switching module comprises a computer usable medium having computer readable program code embodied therein for selectively actuating each of said 2x2 optical switching elements, said computer readable program code including a routing algorithm.

43. (Original) The optical interconnect system of claim 42, further comprising a driver disposed in operative engagement with said switching module.

44. (Original) The optical interconnect system of claim 43, comprising a controller operatively engaged with said switching module and with said driver, to control said operative engagement of said switching module with said driver.

45. (Original) The interconnect system of claim 40, wherein each of said 2x2 optical switching element comprises:

a polarizer disposed to receive electromagnetic energy incident thereon from at least two input paths, and to transmit electromagnetic energy along at least two output paths;

at least one phase shifter disposed within said at least two input paths; and

said at least one phase shifter being selectively actuatable to pass electromagnetic energy therethrough alternately with and without shifting the phase thereof.

46. (Original) The interconnect system of claim 45, wherein said polarizer is disposed at an intersection of said at least two input paths and said at least two output paths.

47. (Original) The interconnect system of claim 45, wherein electromagnetic energy incident on said polarizer from any one of said at least two input paths is transmittable along any one of said at least two output paths.

48. (Original) The interconnect system of claim 45, further comprising at least one phase shifter disposed in each of said at least two input paths, wherein a plurality of said phase shifters are independently actuatable relative to one another.

49. (Original) The interconnect system of claim 48, wherein each of said phase shifters is substantially planar and disposed orthogonally relative to the input path passing therethrough.

50. (Original) The interconnect system of claim 45, wherein said phase shifter is disposed in spaced relation relative to said polarizer, so that said at least two output paths are free from said phase shifter.

51. (Original) The interconnect system of claim 45, wherein said at least two input paths are mutually orthogonal, and said at least two output paths are mutually orthogonal.

52. (Original) The interconnect system of claim 50, wherein said polarizer is substantially planar and disposed at a 45 degree angle to each of said at least two input paths.

53. (Original) The interconnect system of claim 52, comprising:

a solid being transparent to said electromagnetic energy;

said solid having four mutually orthogonal faces;

said planar polarizer disposed at a 45 degree angle to each of said four mutually orthogonal faces; and

at least one phase shifter being disposed on each of two adjacent ones of said four mutually orthogonal faces;

wherein said output paths pass through two adjacent other ones of said four mutually orthogonal faces.

54. (Original) The interconnect system of claim 45, further comprising a computer usable medium having computer readable program code embodied therein for selectively actuating said at least one phase shifter, wherein said computer readable program code includes a routing algorithm.

55. (Cancelled)

56. (Original) The optical interconnect system of claim 40, wherein each of said plurality of all-optical signal paths has substantially the same latency.

57. (Original) The optical interconnect system of claim 40, wherein each of said plurality of all-optical signal paths are contention-free relative to one another.

58. (Original) The optical interconnect system of claim 57, wherein each of said plurality of all-optical signal paths are adapted to simultaneously maintain a plurality of electromagnetic signals therein.

59. (Original) The optical interconnect system of claim 40, wherein each of said plurality of all-optical signal paths provides substantially the same signal attenuation relative to one another.

60. (Original) The optical interconnect system of claim 40, further comprising:

N inputs and N outputs;

said plurality of all-optical signal paths being contention-free and adapted to couple each of said N inputs to each of said N outputs, using $N(\log_2 N-1)$ of said optical switching elements.

61. (Original) The optical interconnect system of claim 40, wherein each one of said optical switching elements further comprises:

a solid being transparent to said electromagnetic signals;

said solid having four mutually orthogonal faces;

said planar polarizer being disposed at a 45 degree angle to each of said four mutually orthogonal faces;

at least one phase shifter being disposed on two adjacent ones of said four mutually orthogonal faces; and

each of said plurality of said optical switching elements being disposed in corner to corner relation to one another.

62. (Original) The optical interconnect system of claim 40, wherein said optical switching elements each comprise:

a solid being transparent to said electromagnetic signals;

said solid having four mutually orthogonal faces;

said planar polarizer being disposed at a 45 degree angle to each of said four mutually orthogonal faces;

at least one phase shifter being disposed on two adjacent ones of said four mutually orthogonal faces; and

each of said optical switching elements being disposed in surface to surface relation to one another.

63. (Original) The optical interconnect system of claim 40, comprising:

a 4x4 interconnect block having first, second, third and fourth 2x2 optical switching elements;

wherein an output path of said first 2x2 switching element is coupled to an input path of said third 2x2 switching element, an other output path of said first 2x2 switching element is coupled to an input path of said fourth 2x2 switching element, an output path of said second 2x2 switching element is coupled to input of said third switching element, said an other output path of said second switching element is coupled to an input path of said fourth 2x2 switching element.

64. (Original) The optical interconnect system of claim 63, wherein said first, second, third and fourth 2x2 switching elements are disposed in surface to surface alignment with one another.

65. (Original) The optical interconnect system of claim 63, wherein said first, second, third and fourth 2x2 switching elements are disposed in corner to corner alignment with one another.

66. (Original) The optical interconnect system of claim 65, further comprising a plurality of said 4x4 interconnect blocks.

67. (Original) The optical interconnect system of claim 63, wherein input paths of said first and second 2x2 switching elements comprise inputs of said 4x4 optical interconnect block, and outputs of said third and fourth 2x2 switching element comprise outputs of said 4x4 interconnect block.

68. (Original) The optical interconnect system of claim 67, further comprising a plurality of said 4x4 interconnect blocks coupled to one another.

69. (Original) The optical interconnect system of claim 68, being fabricated as a unitary device.

70. (Original) The optical interconnect system of claim 69, further comprising a plurality of mirrors disposed therein.

71. (Original) The optical interconnect system of claim 68, further comprising an 8x8 device.

72. (Original) The optical interconnect system of claim 68, further comprising a 16x16 interconnect device.

73. (Original) The optical interconnect system of claim 68, wherein said 4x4 interconnect blocks are coupled to one another in a Benes Network.

74. (Original) The optical interconnect system of claim 68, wherein said 4x4 interconnect blocks are coupled to one another in a PM2K network.

75. (Original) The optical interconnect system of claim 68, wherein said 4x4 interconnect blocks are coupled to one another in a shuffle exchange architecture.

76. (Original) The optical interconnect system of claim 40, further comprising a NxN device, where N is the number of inputs and outputs.

77. (Currently Amended) A method for selectively interconnecting a plurality of electromagnetic signals between a plurality of inputs and a plurality of outputs, the method comprising:

providing a plurality of solid state selectively actuatable 2x2 optical switching elements;

configuring the 2x2 optical switching elements to form an optical interconnect device having a plurality of all-optical signal paths extending through the 2x2 optical switching elements between the inputs and the outputs, wherein each of the all-optical signal paths has substantially the same pathlength; and

selectively actuating the 2x2 optical switching elements to interconnect the electromagnetic signals between the inputs and the outputs by switching the polarization states of said electromagnetic signals.